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Cover: Female mountain skink, *Plestiodon callicephalus*, manipulating one of her eggs. Photograph by Daniel Cruz-Sáenz.

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Notes on the Herpetofauna of Western Mexico 4: A Case of Parental Care in the Mountain Skink (*Plestiodon callicephalus*) in Huaxtla, Zapopan, Jalisco, Mexico

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Salvador Narváez-Torres³ and Edgar Flores-Covarrubias²

Abstract

Intensive sampling was conducted to study the herpetofauna of the oak forest in the locality of Huaxtla, Zapopan, Jalisco, Mexico; the search was done in feasible habitats such as under rocks, in crevices, trees, leaf litter. Sampling was conducted in an area of 1.8 ha, during the period from July to December of 2010. We registered 30 *Plestiodon callicephalus*, of which 23 were adults, five were juveniles and two were neonates. Of these, two females with their eggs were observed conducting parental care. This is the first report of parental care for the species in Mexico.

Keywords: Parental care, *Plestiodon callicephalus*

Resumen

Para este estudio se realizaron muestreos intensivos de herpetofauna en un bosque de encino localizado en Huaxtla, Zapopan, Jalisco, México. La búsqueda se llevó a cabo entre los microhábitats viables como son: bajo rocas, en las grietas, árboles, hojarasca, etc. El muestreo se realizó en un área de 1,8 ha, durante el período comprendido entre julio y diciembre de 2010. Registramos 30 individuos de *Plestiodon callicephalus*, de los cuales 23 eran adultos, cinco eran juveniles y dos fueron recién eclosionados. De éstas, dos hembras con sus huevos fueron observados realizando cuidado parental. Este es el primer reporte de cuidado parental en una especie de escíncido para México.

Palabras claves: Cuidado parental, *Plestiodon callicephalus*

Introduction

Parental care is defined as a form of altruism in which, by spending time and energy in aiding its offspring, the parent is increasing the fitness of the offspring to the detriment of its own fitness; it is favoring current offspring at the expense of possible future offspring (McFarland, 2006). Parental care in reptiles has been correlated with cold climates and harsh environments (Shine, 1988; Halloy et al., 2007), as has viviparity (Shine, 2004). Parental care has been reported in more than 140 species of reptiles (about 3%), but many records are either ambiguous or inadequate (Somma, 1990, 2003).

Parental care in skinks consists of nest construction and maintenance, hydoregulation and thermoregulation of the nest, coiling around and brooding eggs, brood defense, ingestion of spoiled or unfertilized eggs, manipulation or retrieval of eggs, parental assistance of neonates during hatching, and help with neonatal feeding (Fox, 2009). Neill (1964) used the term “egg-guarding” for egg-laying snakes that remain with their clutches. Groves (1982) used the term “brooding behavior,” however, for lizards that remain with their eggs throughout their incubation period.

As the embryo develops in the egg, nitrogenous wastes build up. Such wastes and remaining albumin likely produce chemical cues upon hatching, which could attract predators. Even in

lizards in which females brood the eggs, near synchronous hatching occurs at which time all hatchlings and the female abandon the nest (Pianka and Vitt, 2003: p. 84).

All known oviparous *Eumeces* of the Old World, *Plestiodon* of the New World and some anguids brood their eggs (Pianka and Vitt, 2003; but for recent systematics and nomenclature changes see Griffith et al., 2000; Schmitz et al., 2004; Smith, 2005). There has been much documentation of parental care in lizards, but in particular the nesting activity known as brooding has been documented in a number of skinks (Scincidae):

- Evans (1959) documented maternal behavior of the Great Plains skink, *Plestiodon obsoletus*.
- Groves (1982) documented egg-eating behavior of brooding five-lined skinks, *Plestiodon fasciatus*, a species for which brooding behavior had been studied by other herpetologists, such as Noble and Mason (1933) and Fitch (1954). It seems that females brooding their eggs will detect those that are not in optimal condition to hatch, consuming them, and thus possibly preventing the viable eggs from being contaminated by fungus or other microorganisms that might be present in the soil or addled eggs. The female maintains an olfactory interest when her eggs are still viable.
- Hasegawa (1985), in his work with *Eumeces okadae* on

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Miyake-jima, Izu Islands, Japan, documented the effect that brooding has on reducing egg mortality rates.

- Frese (2003) reported this activity in the northern prairie skink, *Plestiodon septentrionalis septentrionalis*, as a matter of transporting eggs to a more comfortable and stable thermal environment.
- Somma (1987a, b) mentions parental care in the prairie skink, *Plestiodon septentrionalis*, in which a female was brooding her eggs. In this example brooding facilitates embryonic development by maintaining high humidity within the nest through respiratory water loss (Somma, 1989; Somma and Cochran, 1989; Somma and Fawcett, 1989; Somma, 1990).
- Moulis and Williamson (1998) documented the brooding activity of two female broadhead skinks, *Plestiodon laticeps*, in the month of July in the area of Thomas County, Georgia, where females and their clutches were measured.
- Huang (2006) also documented parental care in the long-tailed skink *Mabuya longicaudata* on Orchid Island of Taiwan, where females brooding their eggs had a higher probability of surviving the predation of *Oligodon formosanus* than those that were abandoned by the females. Also lizards here had the ability to identify species that predated on lizard eggs and those that did not, increasing probability of survival.

In some regions parental care may confer a selective advantage to species of scincids. This view is underscored by the replacement of teiids by scincids at high elevations in the Western Hemisphere. Teiids are particularly successful in arid and tropical environments where adequate solar heating is available for body metabolism and egg incubation. At higher elevations in cool temperate forests, teiids may be absent, whereas scincids are successful, perhaps due in part to their brooding behaviors (Noble and Mason, 1933; Vitt and Cooper, 1989).

Currently there are 16 recognized species of genus *Plestiodon* that occur in México (Liner and Casas-Andreu, 2008). Eleven species of this genus are listed in the Mexican wildlife agency NOM-059-ECOL-2001 (SEMARNAT, 2010), eight in the conservation category of “Special Protection.”

The *lincer de barranco* or mountain skink, *Plestiodon calli-cephalus*, has no status under Mexican wildlife laws. It reaches the northern limits of its range in the sky islands of southeastern Arizona and extreme southwestern New Mexico. In Mexico the range includes the Sierra Madre Occidental of Sonora, Chihuahua and Sinaloa, and extends south to the states of Nayarit and northern Jalisco (Cruz-Sáenz et al., 2008; Swann et al., 2009).

The specific scientific name of the mountain skink, *calli-cephalus*, comes from the Greek words for “beautiful head.” The name is believed to refer to the Y- or lyre-shaped light line on the head of this species (Swann et al., 2009).

Little is known about this beautiful lizard in the United States of America and Mexico, (Swann et al., 2009). Here we document observations of nesting behavior and aspects of ecology in northern Jalisco.

One problem that montane species will be facing in the future is global warming. It has been documented that some species of lizards in the family Phrynosomatidae are in danger of extinction due to this phenomenon (Sinervo et al., 2010; Ballesteros-Barrera et al., 2007)

Study site

Huaxtla is located in northern Jalisco, latitude 20°56'22"N, longitude 103°23'06"W, at 1213 meters above sea level (see Figure 1). Within the municipality of Zapopan and located 20 km northwest of the metropolitan area of Guadalajara, this site is accessed by the Federal Highway #23 to Colotlán. Mountains

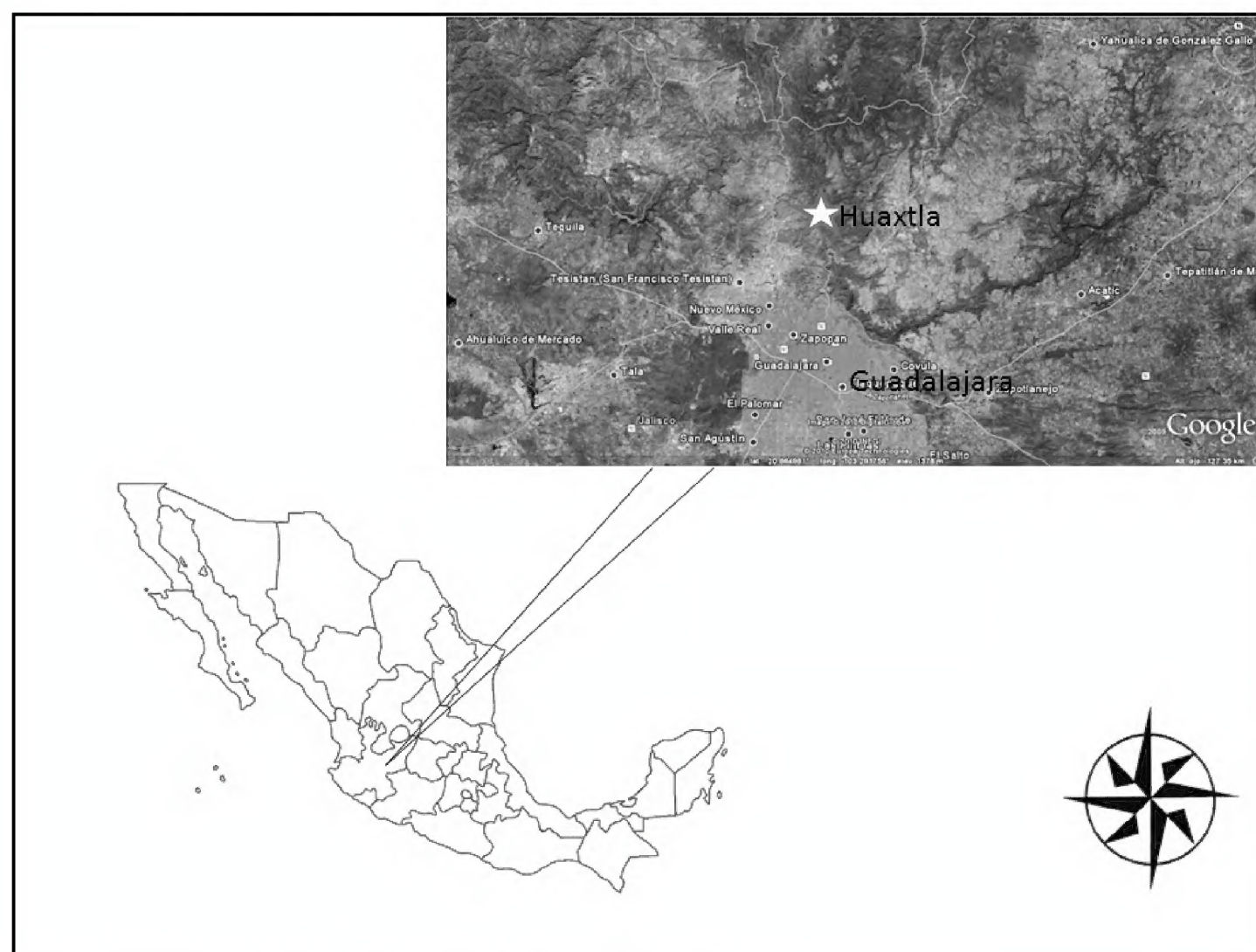


Figure 1. Location of study site, Huaxtla, Zapopan, Jalisco, Mexico.



Figure 2. Female *Plestiodon callicephalus* on her nest; note large eggs compared to her body. Photograph by Daniel Cruz-Sáenz.

here form part of Sierra de San Esteban; dominant vegetation is *bosque de encino* (oak forest), with some patches of *bosque tropical caducifolio* (tropical deciduous forest) on a few slopes and in ravines.

Material and Methods

Intensive sampling was conducted to study the herpetofauna of the oak forest in the locality of Huaxtla; feasible habitats such as under rocks, in crevices, trees, litter, were searched. Sampling was conducted in an area of 1.8 ha.

Sampling was performed over an area of three transects in a band 600 m × 10 m. In each area an intensive search for *Plestiodon callicephalus* was conducted. When a specimen was found, we recorded the habitat and assigned it to a size class: adult, juvenile or neonate.

Results

During the period from July to December of 2010 we registered 30 *Plestiodon callicephalus*, 23 of which were adults, five were juveniles and two were neonates. Specimens were observed active or inactive between 10:25 and 13:30 h; 17 in leaf litter, four on rocks, six under rocks, two on soil and one in a crevice.

On two different occasions we found skinks under rocks on their nests: the first one had seven eggs and the second one had



Figure 3. Female *Plestiodon callicephalus* moving her eggs to a more suitable site. Photograph by Daniel Cruz-Sáenz.

three eggs. On turning the rocks, we observed the females begin to transport the eggs perhaps seeking a more protected and stable thermal environment (Figures 2 and 3).

The two females with their eggs were observed during the month of July.

Conclusion

Some reports of parental care in scincids are summarized above. Here we present the first observations of this behavior for *P. callicephalus* and the first for Mexico which has a high species diversity of scincids. Molecular studies are being conducted to understand the systematics and phylogeny of the family, particularly the *Plestiodon brevirostris* complex (Manuel Feria Ortiz, pers. com.). Ecological studies of individual species are needed by Mexican herpetologists, because many of the species may be strongly impacted by global warming. As Mexico's climate undergoes changes and forest fires increase due to shifting rain patterns, what will happen to this beautiful mountain species and others that require special microhabitat conditions?

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Notes on Reproduction of the Mexican-Plateau Horned Lizard, *Phrynosoma orbiculare* (Squamata: Phrynosomatidae)

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Abstract

Histological examination of *Phrynosoma orbiculare* gonads from Mexico revealed sperm production in males from August and in one from April. One clutch from October contained 10 oviductal eggs. The finding of two females from August with inactive ovaries may indicate not all females reproduce each year. Whether the one male from April undergoing sperm production is typical for *P. orbiculare* will require examination of additional spring samples.

Phrynosoma orbiculare is restricted to Mexico and extends from the Sierra Madre in central western Chihuahua southward into Puebla and northward in the Sierra Madre Oriental to southern Nuevo León and Coahuila (Lemos-Espinal and Smith, 2007). Anecdotal information concerning reproduction is in Davis and Smith (1953), Baur and Montanucci (1998), Hernández-Ibarra et al. (2000), Sherbrooke (2003), Vázquez Díaz and Quintero Díaz (2005), Lemos-Espinal and Smith (2007). *Phrynosoma orbiculare* is viviparous (Sherbrooke, 2003; Lemos-Espinal and Smith, 2007). The purpose of this note is to add information on the reproductive biology of *P. orbiculare*. The first histological information on the reproductive cycle is presented. Due to restrictions on collecting from wild populations, data taken from museum specimens are becoming increasingly important in elucidating the reproductive biology of amphibians and reptiles. This information is also useful in determining phylogenetic affinities of related taxa and formulating conservation policies.

A sample of three male *P. orbiculare* (mean SVL = 79.6 mm $\pm$ 10.4 SD, range = 68–83 mm) and six females (mean SVL = 75.5 mm $\pm$ 10.3 SD, range = 58–83 mm) collected 1957, 1966, 1969, 1974, 1975, 1977, 1981 were examined from the herpetology collection of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California; **Districto Federal:** 36698, 36699, **Durango:** 107227, 126255, **Jalisco:** 1816, **Nuevo Leon:** 138439, **Veracruz:** 119776, 126543, 135984.

Gonads were dehydrated in ethanol, embedded in paraffin, sectioned at 5 μ m and stained by Harris hematoxylin followed with eosin counterstain (Presnell and Schreiber, 1997). Testis slides were examined to identify the stage of the testicular cycle.

Ovary slides were examined for the presence of early yolk deposition. Histology slides were deposited at LACM.

The only stage observed in the testis cycle was sperm formation (spermiogenesis) in which the lumina of the seminiferous tubules were lined by sperm or clusters of metamorphosing spermatids. This stage was occurring in two males from August (LACM 126255, 135984) and one from April (LACM 36698). The smallest male observed undergoing spermiogenesis measured 68 mm SVL (LACM 36698) and was from April. The smallest reproductively active female (LACM 119776) contained oviductal eggs and was from October. Two females of smaller sizes (LACM 1816, SVL = 58 mm) from August and (LACM 36699, SVL = 68 mm) from April were not undergoing yolk deposition and may have been subadults. One road-killed female (LACM 107227, SVL 80 mm) from June contained yolk. Due to the poor condition of this specimen, it was not possible to count the clutch or ascertain if the eggs had ovulated. One female (LACM 138439, SVL = 83 mm) from August and one from September (LACM 126543, SVL = 81 mm) were not undergoing yolk deposition.

Davis and Smith (1953) reported *P. orbiculare* testes from two males collected during August in Morelos were enlarged. Thus my finding of spermiogenesis in August *P. orbiculare* was in keeping with previous observations (Davis and Smith, 1953). However, finding spermiogenesis occurring in LACM 36698 collected in Districto Federal in April was unexpected. Typically fall breeding lizards exhibit regressed testes in spring (Goldberg, 1971a, 1975; Guillelte, 1983; Goldberg and Beaman, 2004). However, three of six *Eumeces brevirostris* from Mexico collected in spring (June) exhibited spermiogenesis, whereas all of

ten from August and September did (Goldberg, 2002). Thus, it is conceivable that the one *P. orbiculare* from April had commenced spermiogenesis early. The germinal epithelium was not reduced in this male and spermatozoa were abundant indicating it was not nearing regression and did not only contain residual sperm from the previous fall. My sample sizes are too small to clarify if this male was out of synchrony from the rest of the population or if *P. orbiculare* breeds in both autumn and spring.

Davis and Smith (1953) reported 12 and 13 enlarged ova from two *P. orbiculare* females collected in August from Morelos. Lemos-Espinal and Smith (2007) reported litter sizes of 9–30. My finding of one female from Veracruz collected in October with 10 oviductal eggs is within the range reported by Lemos-

Espinal and Smith (2007). No embryos were visible. My samples are too small to ascertain whether the one reproductively inactive adult female each from August and September indicates only a portion of the female population reproduces each year.

At this time it is known that certain species of *Phrynosoma* breed in autumn (Goldberg, 1999) versus spring (Goldberg, 1971b, 1983). Examinations of additional males are required to fully characterize the testicular cycle of *P. orbiculare*.

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What You Missed at the April Meeting

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I picked up Mike Rochford at O'Hare airport after his plane had sat on the ramp for nearly an hour waiting for a gate to open. He apologized to me! He'd probably been up since 4 A.M., had taken two flights to get to Chicago, hadn't eaten for several hours, and was sorry I had to wait a bit before I could get him. Humility is not the first trait that I would expect from a person who for six years captured alligators, crocodiles and pythons in the Everglades, but Mike is a person who seems to have an understated view of himself and his accomplishments in spite of capturing the largest wild American crocodile and the largest Burmese python in U.S. In all of his correspondence he never demanded nor even requested anything special and upon meeting him I was immediately impressed with his openness and authenticity. OK, he doesn't have the advanced degrees or long history that many of our speakers have, but he's done a lot for a man his age. Hasn't gone to his head, it seems.

Mike graduated from Kansas State University in 2004 with a bachelor's degree in biology and worked on herp surveys in Colorado before moving to Missouri to radio track massasauga rattlesnakes (*Sistrurus catenatus*). In 2006 he went to work for the University of Florida and worked on an American alligator (*Alligator mississippiensis*) project under Dr. Frank J. Mazzotti and Dr. Kenneth G. Rice. His work expanded to include American crocodiles (*Crocodylus acutus*) and eventually led to Mike performing the majority of diet and telemetry work for a study of the invasive Burmese pythons (*Python molurus bivittatus*). Nearly all his work was in the Everglades. Mike posts on Field Herp Forum (www.fieldherpforum.com), and he brings the same caution and exactitude to his posts there that he brought to his presentation in April. He titled his talk simply "Everglades Python, Alligator, and Crocodile Research." If folks came looking for all the answers to the Burmese python invasion in the Everglades they were disappointed. Mike is too good of a researcher to jump the gun on data that will take a while to parse. What we did get is an insight into the processes involved in recognizing, declaring, and controlling an invasive animal. While most of the talk was about pythons, we got a glimpse of how to work with alligators and crocodiles.

If one were not convinced that invasive species are a problem, the first few slides Mike showed should have changed that view. According to a 2004 study, 50,000 foreign species are in the U.S. costing \$120 billion per year in environmental damages and losses and putting at risk 42% of the species on the endan-



Photograph of Mike Rochford by Dick Buchholz.

gered or threatened list. As most of us know, Florida leads in non-native species, including the largest number of non-native herpetofauna species in the U.S. According to the website of the Everglades Cooperative Invasive Species Management Area (evergladescisma.org), Florida has four species of amphibians and 65 species of reptiles classified as invasive. He showed us photos of some of the invasive species, including the Cuban tree frog (*Osteopilus septentrionalis*), spectacled caiman (*Caiman crocodilus*), Nile monitor (*Varanus niloticus*) as well as the island apple snail (*Pomacea canaliculata*) and perhaps one of the most destructive, the wild boar (*Sus scrofa*) that may be responsible for the failure of some reintro-

duction attempts of the eastern indigo snake (*Drymarchon couperi*).

Overlaid on a picture of an admittedly gorgeous Burmese python were some statistics that helped explained why these snakes are so successful in invading the Everglades. The average adult is 12–13 feet but some individuals may exceed 20 feet; mating is December through April, egg-laying is May and June, and the 8–107 (!) eggs in a clutch hatch in July and August. They are habitat and trophic generalists, primarily ambush predators, and quite at home in the water. Mike sidestepped the debate over the cause of the initial introduction of the pythons, but the first sightings were in the 1980s and the first viable nest was found in 2006. Sightings per year have increased exponentially since the '80s, as have the number of snakes removed since 2000. Maps showed us the sighting locations in the Everglades, with most being along roads or levees, though one was captured in Summerland Key. Mike checked the gut contents on that one and found that it had recently eaten an albino rat, leading him to surmise that it was released or escaped and not part of the breeding population.

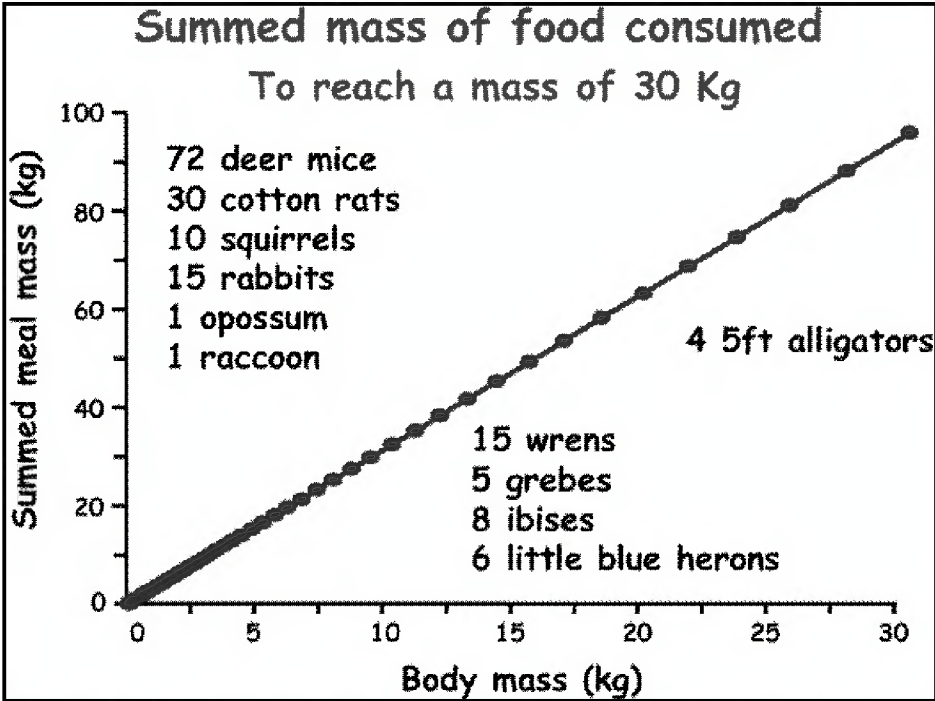
The famous image of a six-foot alligator carcass jutting from a ripped-apart 13-foot python filled the screen as Mike pointed out that there is no doubt that pythons eat alligators. Of course, the opposite is also true. In July 2005 several government and academic institutions came together at an invasive reptile workshop to assemble, fund, permit and deploy a field team in only five months. Goals included researching spatial and temporal ecology of the snakes, their thermal biology, dietary impacts, how best to capture and remove the animals, the reproductive biology and nesting behaviors, and risk assessments of large constrictors in the pet trade. Mike was primarily involved with



Mike and friends showing off the glamorous side of the python catching business. Photograph by Mario Govea, helicopter pilot.



Lots of wading up to the waist while tracking the pythons. Photograph by Alex Wolf.



Hypothetical diet of native food items that one python would consume over five years to reach a mass of 66 pounds (about 13 feet). Chart by Skip Snow.



Mark Perry (left) and Mike showing the results of one day's walking the levees. These are just the captured snakes. Others escaped into the water. Photograph by Matt Brien.



As many as 85 follicles have been found in one dissected snake. Photograph by Skip Snow.



How to collect morphometric data on alligators. Photograph by Mike Rochford.



Mike (left) straddling the largest live crocodile captured in the U.S. He claims that this was one of the easiest to catch. Photograph by Mario Aldecoa.

the spatial and dietary studies.

Pictures of the Everglades habitat and the distances that the snakes travel explained why his telemetry work had to quickly begin using aerial surveys. Not only was this effective in radio tracking, but also on occasion they were able to spot snakes from the air. Telemetry data also implied that these snakes may have homing abilities. Some snakes released a significant distance from the capture point were able to return to that location. More pictures of the habitat with researchers up to the waist in water or vegetation or both convinced me that the pursuit of these animals was not an easy task. As is often the case with snake telemetry, one could be standing almost on top of the target and not see it, and Mike said that he would sometimes find a snake by bumping into an underwater log that moved more than it should. A classic picture showed three very soggy researchers holding a nearly 16-foot female that weighed 156 lbs. They all had smiles. A chart showing the information from implanted data loggers demonstrated that in spite of relatively large fluctuations in environmental temperatures, the snakes are able to maintain a fairly consistent body temperature.

A graphic slide of a dissected snake showed the nearly complete body of a limpkin (*Aramus guarana*), a wading bird, being hauled from the gut. The diet study found birds were 26% of the gut contents, mammals were 68% and they found seven consumed alligators. An interesting graph showed a theoretical combination of native food items that one python would need to consume over five years to grow to about 66 pounds and 13 feet. It is a sobering amount of food.

Mike talked about the survey techniques used to find the pythons, including the common methods of road cruising and levee walking, but also exploring the use of Judas snakes, trapping, dogs and even unmanned aircraft. Using a Judas snake, the researchers found one snake with 85 follicles. If deposited, that would have been a record clutch size for Florida. Even agricultural discing was found to expose and kill snakes in habitat that surprised the researchers. Mike thinks that we will need a combination of these methods to control the pythons.

Risk assessment models have identified 8 lizards and 4 snakes of the 33 most commonly imported reptiles as potentially successful invaders. One, the African python (*P. sebae*), is already breeding in Florida. Whatever your feelings on the methods attempting to limit these threats, one cannot deny that invasive species pose a real concern for the environment and native species. Mike's work and the continuing research hopes to address some of the threats.

We were then treated to action photos of Mike subduing large crocodilians in his work on the American alligator and American crocodile, including pictures of Mike straddling the largest crocodile captured in the U.S., a recapture of an animal marked 22 years earlier by Mike's boss. Using morphometric data collected on the crocodilians the researchers seek to determine the health of the Everglades. Healthy crocodilians mean a healthy Everglades. Few of us were surprised when Mike said that the alligators and crocodiles could be doing better.

As always, I've left much of our speaker's talk out of this writing. If you weren't at the meeting or the dinner afterwards you missed out on Mike's geniality, eagerness to answer questions, and seriousness of purpose though not of personality. You missed out on interacting with people who share your interests. Of course, you also missed out on the continual background music drifting from the Notebaert party happening on the floor below. Mike never let the distractions bother him and delivered a professional, informative talk. Sorry if you weren't there.

Afterword: In the company of CHS member Peter Berg, Mike took advantage of the opportunity to visit the famous "Snake Road" in Union County, Illinois. Mike's post on the Field Herp Forum can be viewed at <http://www.fieldherpforum.com/forum/viewtopic.php?f=2&t=5947>

Herpetology 2011

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

REFLOATING MOA'S ARK

T. H. Worthy et al. [2011, Copeia (1):72-76] describe two fossils from the diverse St Bathans Fauna from Early Miocene sediments in New Zealand and identify them as from a large, probably terrestrial turtle. They are the first freshwater or terrestrial turtles to have been reported from the Cenozoic of New Zealand. Recent authors have used the absence of turtles and species they considered unlikely to raft to New Zealand to debunk the long held theory that an element of the New Zealand fauna was ancient and vicariant and had evolved on what David Bellamy called Moa's Ark. The discovery that large non-marine turtles were once present in New Zealand adds to a growing and diverse list of terrestrial taxa known from Zealandia shortly after its maximum inundation in the Late Oligocene. Many of these taxa, including a diverse herpetofaunal component, represent lineages endemic to New Zealand and had poor dispersal capabilities, supporting the long held view that a part of the Zealandian fauna was vicariant in origin.

BREEDING BIOLOGY OF INDIAN PYTHONS

C. Ramesh and S. Bhupathy [2010, The Herpetological Journal 20(3):157-163] describe aspects of the breeding biology of free-ranging *Python molurus molurus*, based on observations during May–August 2008 in Keoladeo National Park, Bharatpur, India. For two females, the incubation period was 74 days, with a hatching success of 95%. All neonates dispersed on the fifth night from the date of first pipping. Incubating females did not feed, and abandoned the nests after 61 days, leaving them unattended for 11–13 days before hatching of eggs. Female pythons maintained a body temperature of $32.5 \pm 0.78^\circ\text{C}$ during incubation despite atmospheric temperatures varying between 9.7°C above and 6.1°C below this value. It appears that this was achieved by shivering thermogenesis, and changes in the coiling posture around the eggs; these data thus provide field-based evidence of facultative endothermy in this species. It is hypothesized that females leave the nest in order to facilitate the increased oxygen demand by embryos at late stages.

GIANT SOFTSHELL MUSEUM SPECIMENS

R. Gemel and E. Haring [2011, Herpetozoa 23(3/4):67-77] note that preserved voucher specimens of giant trionychid turtles of the genera *Chitra* and *Pelochelys* are rare in scientific museum collections. Therefore, and because of the remarkable record locality, two shells in the collection of the "Zoologische Staatssammlung" in Munich, Germany, attributed to *Pelochelys cantorii* were examined by morphological and genetic methods to verify their taxonomic allocation. One of these shells, originating from the Schlagintweit Collection, was collected in Sindh, Pakistan, and would be the first record of *P. cantorii* from the Indus river system. The analysis shows that both shells are to be assigned to *Chitra indica*. A table of shell characters is provided to distinguish *Chitra* and *Pelochelys*.

A MODEST PROPOSAL

G. Perry and M. Farmer [2011, J. Herpetology 45(1):134-141] note that invasive species are a major threat to biodiversity and economic interests, with many introductions resulting from actions of people involved in pet and ornamental plant businesses. Invasive species eventually end up in the care of the general public, with most costs born by society rather than businesses or owners: a classic economic externality. Although standard economic instruments used to address externalities are useful, they require considerable extension in this case. Simple taxation of the trade has been suggested and can reduce the volume of trade, but taxes do little to discipline the riskiest actors in the market. Using reptiles and amphibians as their focus, the authors provide an outline for a mechanism addressing invasive species issues, focusing primarily on the local level. They propose to collect funds from the trade and apply them specifically to support (1) a national resource center offering information and training; (2) programs to professionalize local education and response teams, focusing on pet store owners, hobbyist organizations, and first responders; (3) an incentive program to encourage pet stores to take back unwanted animals; (4) a tracking system for identifying and penalizing owners of newly released animals; and (5) a rapid-response system to address newly reported invasives. Participation by local entities helps them avoid uniform policies from the national level that are typically both more onerous and less effective. To provide an additional incentive for the industry at large to participate in the process, the level of taxation could decrease as problems diminish.

INFRARED ORGANS OF SNAKES

R. C. Goris [2011, J. Herpetology 45(1):2-14] reports that the infrared organs of boas, pythons and pit vipers are true eyes that function not by a photochemical reaction but on the basis of heat generated in the receptors (called terminal nerve masses, TNMs), by electromagnetic radiation. In the pythons and pit vipers, the pit opening acts as the aperture of a pinhole camera, a virtual lens that permits the receptors to encode the movements of an infrared source sufficiently for the brain to form an image. Many boid snakes possess TNMs identical to those of the pythons but lack an opening that could serve as a lens. All TNMs are irrigated by a dense capillary network that serves as a heat regulator, mimicking the role of the photochemical cycle in the lateral eyes. Thus, the pits are an integral part of the snakes' visual system, which makes use of the longer waves of the electromagnetic spectrum for which there are no appropriate photoreceptive pigments in nature; they do everything the eyes do. They are definitely not, as they have often been treated, a "sixth sense," useful only for the detection and acquisition of prey. Just as the world that most insects see includes both the visual and the ultraviolet spectra, so the world that boas, pythons and pit vipers see includes both the visual and the infrared spectra.

Unofficial Minutes of the CHS Board Meeting, April 15, 2011

The meeting was called to order at 7:48 P.M. at the Schaumburg Public Library.. Board members John Archer, Jim Foster, Lawrence Huddleston and Jenny Vollman were absent.

Officers' Reports

Recording Secretary: Cindy Rampacek read the minutes of the March 17 board meeting and they were accepted as read

Treasurer: Andy Malawy presented the financial report. It was discussed and accepted. 'Fest expenses and income were discussed. We will be getting estimates on the oval display cages to be used for ReptileFest.

Membership Secretary: Mike Dloogatch read a list of memberships due to expire. We have a nice membership boost, with pre-Fest sign-ups and fest sign-ups. We also had a lot late renewals come in.

Sergeant-at-arms: Greg Brim reported that there were 50 people at the March meeting.

Corresponding Secretary: Deb Krohn will be sending out the thank-yous for 'Fest. Deb really wants to move the phone number to a cell phone.

Publications Secretary: Aaron LaForge will be updating the speakers on the CHS website.

Committee Reports

Shows:

- Notebaert, First full weekend of each month
- Cosley Zoo, Father's Day weekend, June 18-19.
- SEWERFest, July 31
- Unity Fest at Marquette Park, September 10
- Unity Walk at Soldier Field, September 24
- Snake Day at the Milwaukee Public Museum, November 5

Old Business

Spring picnic: May 21 at the Wildlife Discovery Center in Lake Forest.

Zoo trip: Still up in the air.

New Business

Reptile Fest wrap-up discussion: Deb expressed the need for assistance with speakers next year. Gripes, complaints, positive thoughts, etc., were shared. It was discussed that with the Hoppenraths stepping down, a committee may be a good idea. Aaron Laforge moved that the CHS give Andy Sagan \$250 to buy thank-you gifts for the marketing team that donated their time to our event. Deb Krohn seconded the motion and it was approved unanimously.

Round Table

Linda has poison ivy.

Every year at fest, Deb gives it her all, and every Sunday night after 'Fest, she is soooo exhausted at the end. She justifies it with a variety of issues, but she feels guilty that she isn't there to help with teardown. And she feels Bob and Dan Bavarsha give it more than anyone else. Deb expressed her thanks and gratitude to Bob and Dan.

Dick can't help anymore with teardown but he had so much help, he was exceptionally thankful to still do 'Fest.

Nancy thought the volunteer help with loading and unloading was amazing

Greg is impressed with the bookkeeping job our treasurer does these days.

Linda thanked everyone who helped at the herps of Illinois display.

Bob requested that the CHS send a formal thank-you to Bill Bavarsha.

The meeting was adjourned at 9:45 P.M.

Respectfully submitted by recording secretary Cindy Rampacek



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For sale: books. *New Zealand Amphibians & Reptiles* by Joan Robb, 1980, 128 pp., 32 color plates, some with as many as 5 photos each, 7 figs., range maps, includes the tuatara, geckos and skinks; DJ with mylar cover; excellent condition, \$85; *Encyclopedia of Australian Animals—Reptiles* by Harald Ehmann, 1992, 495 9" × 12" pp., excellent color photos from the National Photographic Index of Australian Wildlife of nearly every species found in Australia, range maps, natural history information, a comprehensive, impressive work; DJ with mylar cover; as new, \$210; *Australia's Reptiles—A Photographic Reference to the Terrestrial Reptiles of Australia* by Stephen Wilson and David Knowles, 1988, 447 pp., almost 850 color photos of nearly every species and many subspecies, descriptions, habitat, range maps, some natural history info, DJ with mylar cover, excellent condition, \$130; *Birds of America—John James Audubon*; 1997; 504 14½" × 11" pp., published by Laurel Glen Publishing; the complete collection of 435 illustrations from the most famous bird book in the world, excellent reproductions of Audubon's work in the order they appear in the original, front of DJ has two-inch slit and is rippled at bottom edge, otherwise book is in excellent condition, \$240. All books sent postpaid in U.S. Books subject to prior sale. William R. Turner, 7395 S. Downing Circle W.; Centennial, CO 80122 telephone (303) 795-5128; e-mail: toursbyturner@aol.com

For sale: Trophy quality jungle carpet, diamond-jungle, and jaguar carpet pythons. Website: moreliatrophyclub.com E-mail: junglejohn@tds.net.

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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, May 25, at the Peggy Notebaert Nature Museum, Cannon Drive and Fullerton Parkway, in Chicago. **Cindy Steinle** will speak about “Women in the Reptile Community.” Cindy Steinle is president of Wisconsin-based Small Scale Reptile Rescue and is involved in pit bull rehabilitation. She is a site coordinator for kingsnake.com. She has served on the board of the Chicago Herpetological Society for several years. She serves in education outreach for the International Reptile Conservation Foundation. All of these activities mean she is well known throughout the reptile community and frequently travels around the country for her various roles.

The June 29 meeting will be our popular and always well-attended annual **Show & Tell** meeting. Bring an animal that you find interesting for one reason or another and be prepared to give a short (under five minutes) presentation to the group. Don't be shy. Neither age (yours) nor commonness (the animal's) should be a limitation.

The regular monthly meetings of the Chicago Herpetological Society take place at Chicago's newest museum—the **Peggy Notebaert Nature Museum**. This beautiful building is at Fullerton Parkway and Cannon Drive, directly across Fullerton from the Lincoln Park Zoo. Meetings are held the last Wednesday of each month, from 7:30 P.M. through 9:30 P.M. Parking is free on Cannon Drive. A plethora of CTA buses stop nearby.

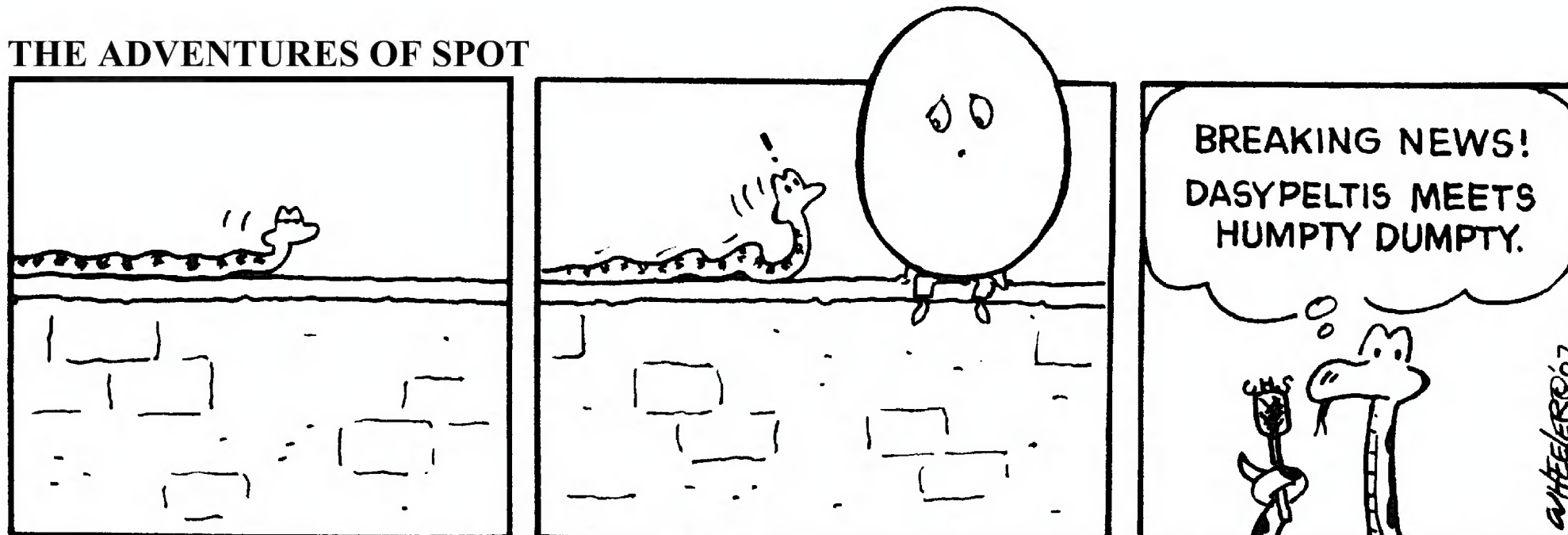
Board of Directors Meeting

Are you interested in how the decisions are made that determine how the Chicago Herpetological Society runs? And would you like to have input into those decisions? If so, mark your calendar for the next board meeting, to be held at 7:30 P.M., June 17, in the adult meeting room on the second floor of the Schaumburg Township District Library, 130 S. Roselle Road, Schaumburg.

The Chicago Turtle Club

The monthly meetings of the Chicago Turtle Club are informal; questions, children and animals are welcome. Meetings normally take place at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Parking is free. For more info visit the CTC website: <http://www.geocities.com/~chicagoturtle>.

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